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Deconstruction
Jaquet Droz

The Charming Bird

Automaton

by

**THE NAKED
WATCHMAKER**

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A Brief History

From 1738 Pierre Jaquet-Droz started working in clockmaking. He produced a series of longcase clocks and married Marianne Sandoz in 1750. Soon after the birth of his two children, Julie in 1751 and Henri-Louis in 1752, Pierre Jaquet-Droz lost his wife, followed by his daughter in 1755. He met George Keith, Earl Marischal, governor of the principality of Neuchâtel, who advised him to present his clocks abroad, in Spain where he could help introduce him to the court. With this support, Pierre Jaquet-Droz, along with his father-in-law and a young hired hand named Jacques Gevril, they built a carriage specially designed to carry six clocks and set off for Spain in 1758. They travelled for 49 days and were received in Madrid by Don Jacinto Jovert, a Spanish nobleman. After a wait of several months, Pierre Jaquet-Droz presented his clocks to King Ferdinand VI of Spain. A few days later, the clockmaker received 2,000 gold pistoles in payment for the timepieces which were purchased for the royal palaces of Madrid and Villaviciosa.

Upon his return to La Chaux-de-Fonds in 1759, the sum of money he had brought back from Spain enabled Pierre Jaquet-Droz to concentrate on making watches, clocks and automata. Assisted by his son and a neighbour's son, Jean-Frédéric Leschot, whom he had taken in after the death of the boy's mother and thought of as his adoptive son. This was the beginning of a close partnership. From 1773 onwards, Jaquet-Droz and Leschot perfected and marketed increasingly sophisticated automata.

Their work culminated with the three humanoid

automata: The Writer, The Draughtsman and The Musician, presented in La Chaux- de-Fonds in 1774. Encouraged by this success, the Jaquet-Droz family took to the road to exhibit their products. From La Chaux- de-Fonds they travelled to Geneva and then, in 1775 to Paris where they presented the automata to Louis XVI and his queen, Marie-Antoinette. They went on to show their work at the principal courts of Europe, with visits to London, Holland and Flanders in 1780 and 1781, as well as northern France. They returned to Paris in 1782, 1783 and travelled to Lyon in 1784. The automata were also demonstrated at the Russian court in Kazan, in Madrid and beyond.

Pierre Jaquet-Droz decided to set up a workshop in London, under the management of his son, Henri-Louis. Exhausted by his travels, the latter delegated some of his responsibilities to Jean-Frédéric Leschot. Leschot was tasked in particular with overseeing the business relationship with the prominent trading company James Cox London, whose agents in Canton opened up the Far Eastern market for the Jaquet-Droz Company and for many years represented it in China, India and Japan. Pierre Jaquet-Droz always had a passion for nature and birds which he illustrated through his clocks, snuff boxes, pocket watches and automata. Over 600 pieces were exported to China in 10 years, Jaquet-Droz father and son captivated the Qianlong Emperor himself and the Mandarins at the Imperial Court, who all had an interest in European mechanical watches and automata. Several Jaquet-Droz automata and pocket watches still remain in the Imperial Palace museum today. Pierre Jaquet-Droz set up a team of watchmakers in the Neuchâtel Mountains. From

1783, management of the London operation, established in the Bartlett's Building, was turned over to a new business partner, Henry Maillardet. The Jaquet-Droz family supervised the work of the manufacturing chain (clockmakers, engravers, jewelers, enamellers, painters and musicians) and handled the administration and the commercial side of all their businesses.

For ten years, the company continued to expand. It sold clocks, automata, watches and singing birds all over the world, primarily in China. In 1784, he decided to move to Geneva, Jean-Frédéric Leschot soon joined him and they decided to open the city's first clockmaking manufacture, simultaneously introducing the production of timepieces featuring complications.

Jaquet-Droz was admitted to the newly reinstated Société des Arts, and was active in the advancement of technical training. Pierre Jaquet-Droz moved into the house of a clockmaker named Dental, at the corner of Rue Molard and Rue du Rhône, which housed the workshops and his son's apartment. In 1788, the success and prosperity of Jaquet Droz & Leschot peaked, but this period was short-lived. In 1790, drafts made on their principal correspondent in China came back unpaid and their main client in London failed, putting the company in the red. The partnership with Henry Maillardet had to be liquidated. These misfortunes darkened Pierre Jaquet-Droz's final years. He left Geneva to live in Bienne, Switzerland, where he died in 1790. His son died the following year during a trip to Naples with his wife. He was 39 years old. Due to the disastrous economic repercussions of the

French Revolution in 1789 and the conflicts that arose as a result, the business, now headed by Jean-Frédéric Leschot, ran into serious financial difficulties. He continued to make snuffboxes and singing birds, but had to show great prudence: customers were notified that he now preferred to be paid cash on delivery and would no longer sell to faraway markets. The Napoleonic Wars, which pitted France against nearly every other nation of Europe, put an end to prosperity for the nobility and well-to-do bourgeoisie. The Continental Blockade, decreed by Napoleon in 1806, killed off any remaining market for luxurious objects and greatly inhibited trade with England. For Jaquet-Droz & Leschot, this was the end of a period of great creativity and prosperity.

Jaquet Droz brand joined the Swatch Group in 2000. In 2010, the company moved to its Atelier to La Chaux-de-Fonds.

Today Jaquet Droz pursues three fundamental avenues 1) “the Grande Seconde”; from the perspective of DNA this is recognisable as Jaquet Droz and differentiates itself from other brands. Today it is developed with various new complications being added. 2) Artisanal workshops that have been built internally, with enamelling, engraving, miniature painting etc. 3) Automata, such as the Charming Bird, Bird Repeater, Tropical Bird, Loving Butterfly or Lady8 Flower are constantly being developed and produced and differentiate and characterize the Jaquet Droz identity.

The above text (an abridged version of Pierre Jaquet Droz history) are reproduced courtesy of Jaquet Droz SA.

The Charming Bird

A modern interpretation of an early automaton singing bird. Manufactured using micro-mechanics, watchmaking skills and modern materials to overcome the miniaturisation of what were previously (made in the late 18th and early 19th centuries) larger and static based machines.



The watch was developed over a three year period. The first prototype was finished in 2013 and the first completed watches were launched into the market in 2014.



Hand-winding mechanical automaton movement with push-button activation, set at 2 o'clock on the side of the case.



Diameter of case 47 mm.
Watch caliber 29 jewels,
automaton 15 jewels.



The winding crown set at 12 o'clock is for adjusting the automatic calibre, (Jaquet Droz 6150) which sits below the dial and above the automaton's barrel.

Air is allowed into the case for the birds mechanism to breath, also to allow the sound to be easily heard, passing through a titanium perforated grill which is seen on the 9 o'clock side of the case. The grill covers two milled slots traversing the thickness of the case. (The watch is not water-resistant.)



The bird stands high above the movement and is protected by a sapphire dome with a wall thickness measuring over 1mm.





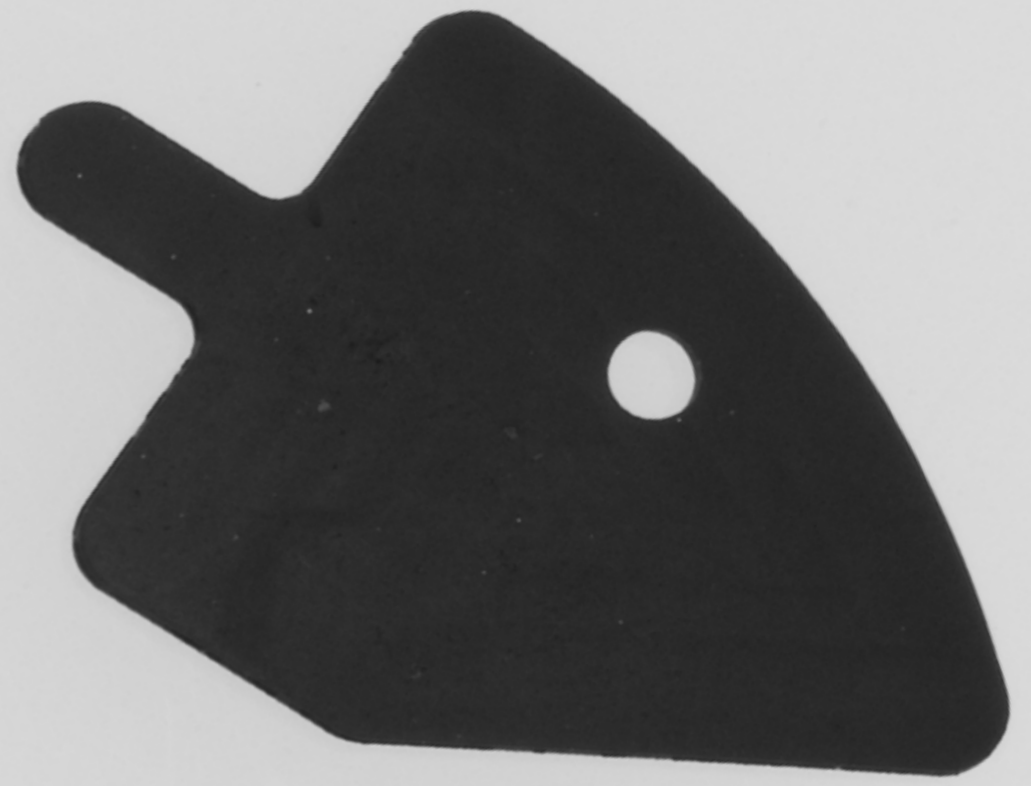
Two different models of bird, the one above is made in 18k gold and hand engraved the one below (shown cased-up) is hand painted.

The pinion on the lower section of the bird assembly links to the rack which turns the birds body. The steel rod below it is pushed vertically by an additional lever found in the movement under the rod. When the lever pushes the rod it causes the beak to open, as well as the wings and tail to move in-synch with the bird song.

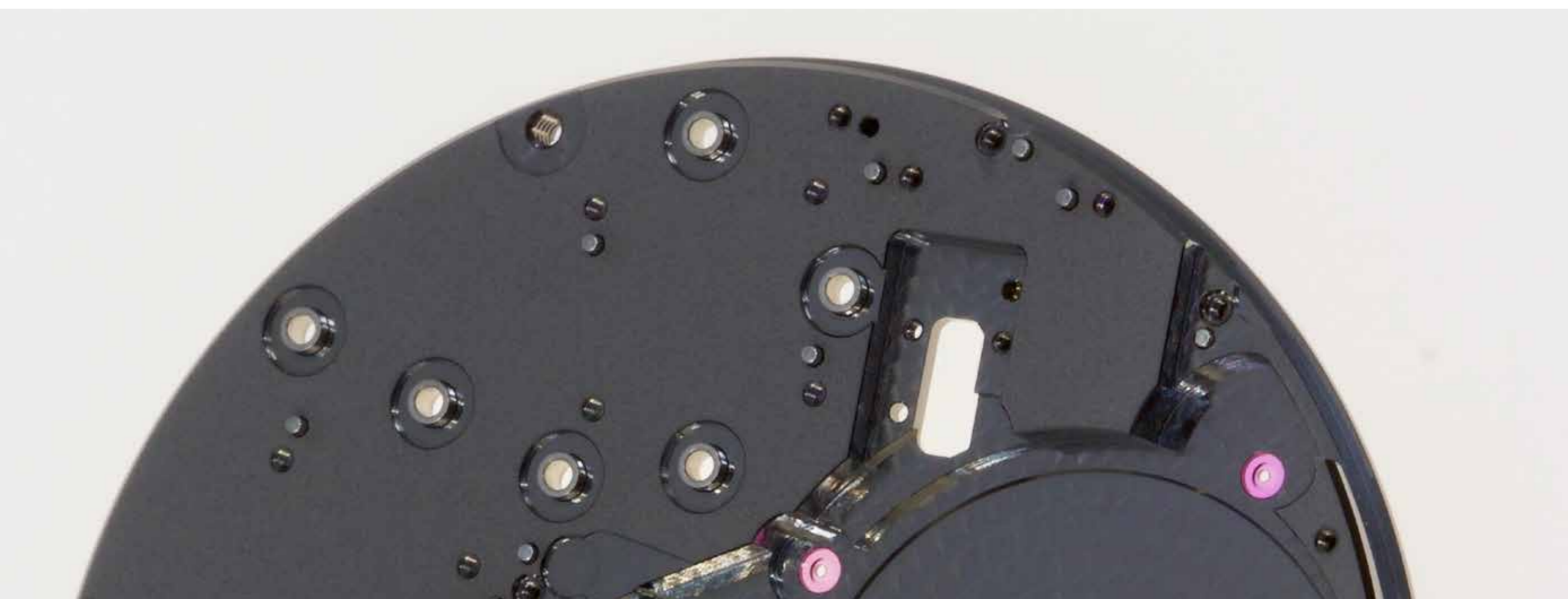




The sapphire case back showing the rear of the automaton mechanism.

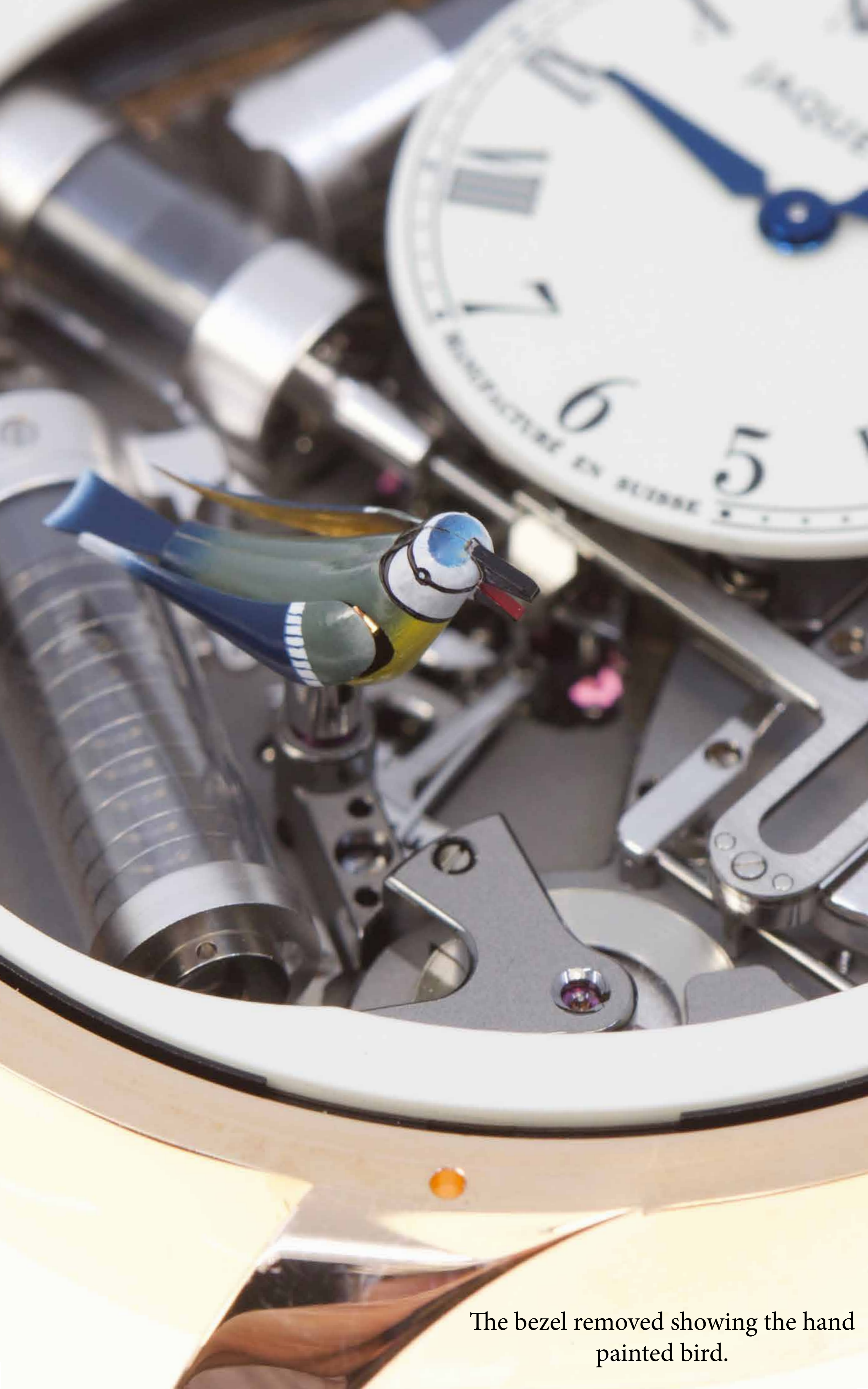


Above, the plate with the hand engraved bird sandwiches in place a flat rubber seal insulating the canals along which the air travels between cylinders. Below are the outlets for the canals which are inturn insulated with round silicon seals.





The bezel removed with the sapphires in place. The bezel is held onto the case centre by 4 plugs screwed from the rear of the watch, pulling down on the 4 threads (3 of which are visible)

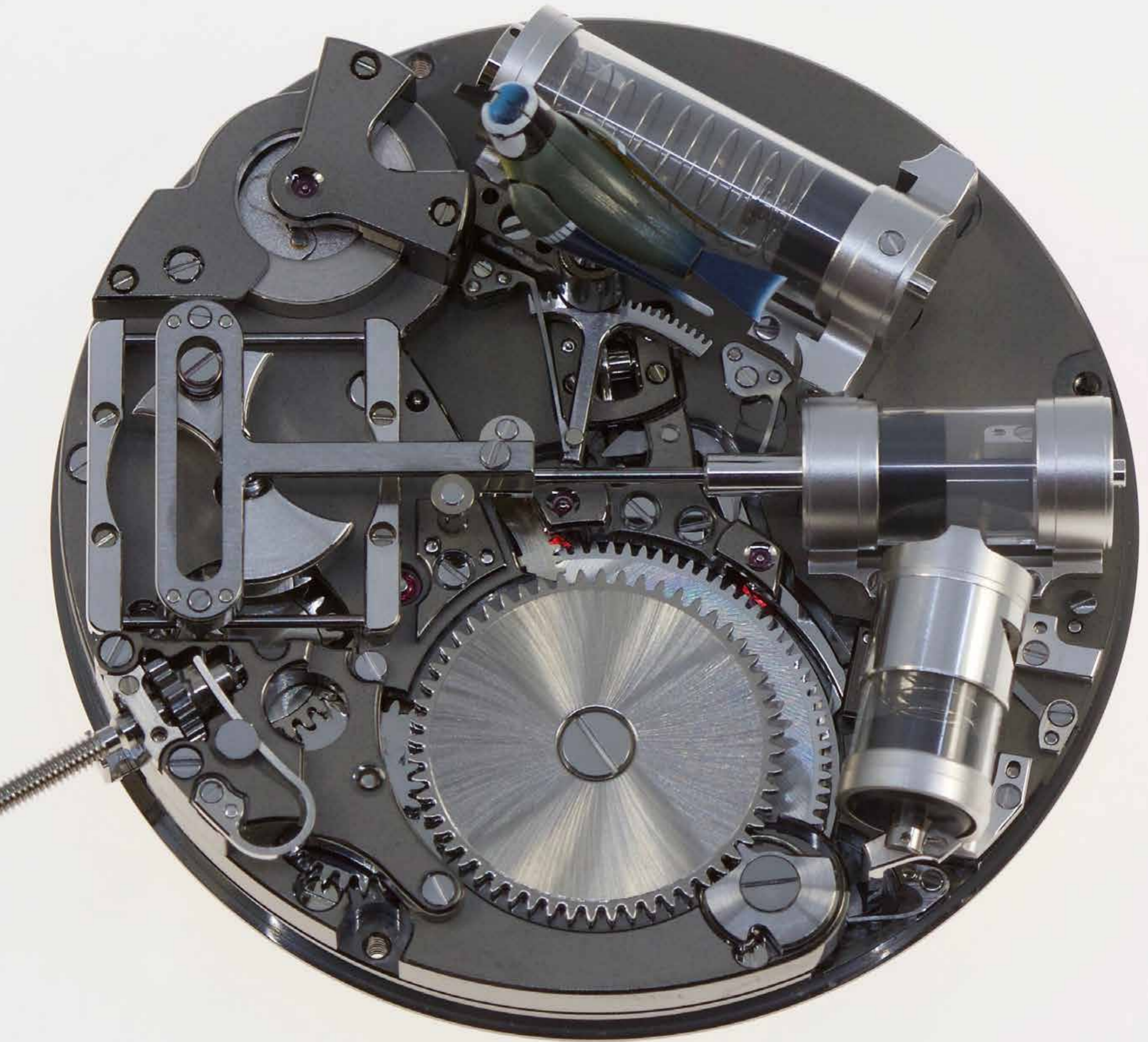


The bezel removed showing the hand painted bird.

The bezel removed showing the full dial.



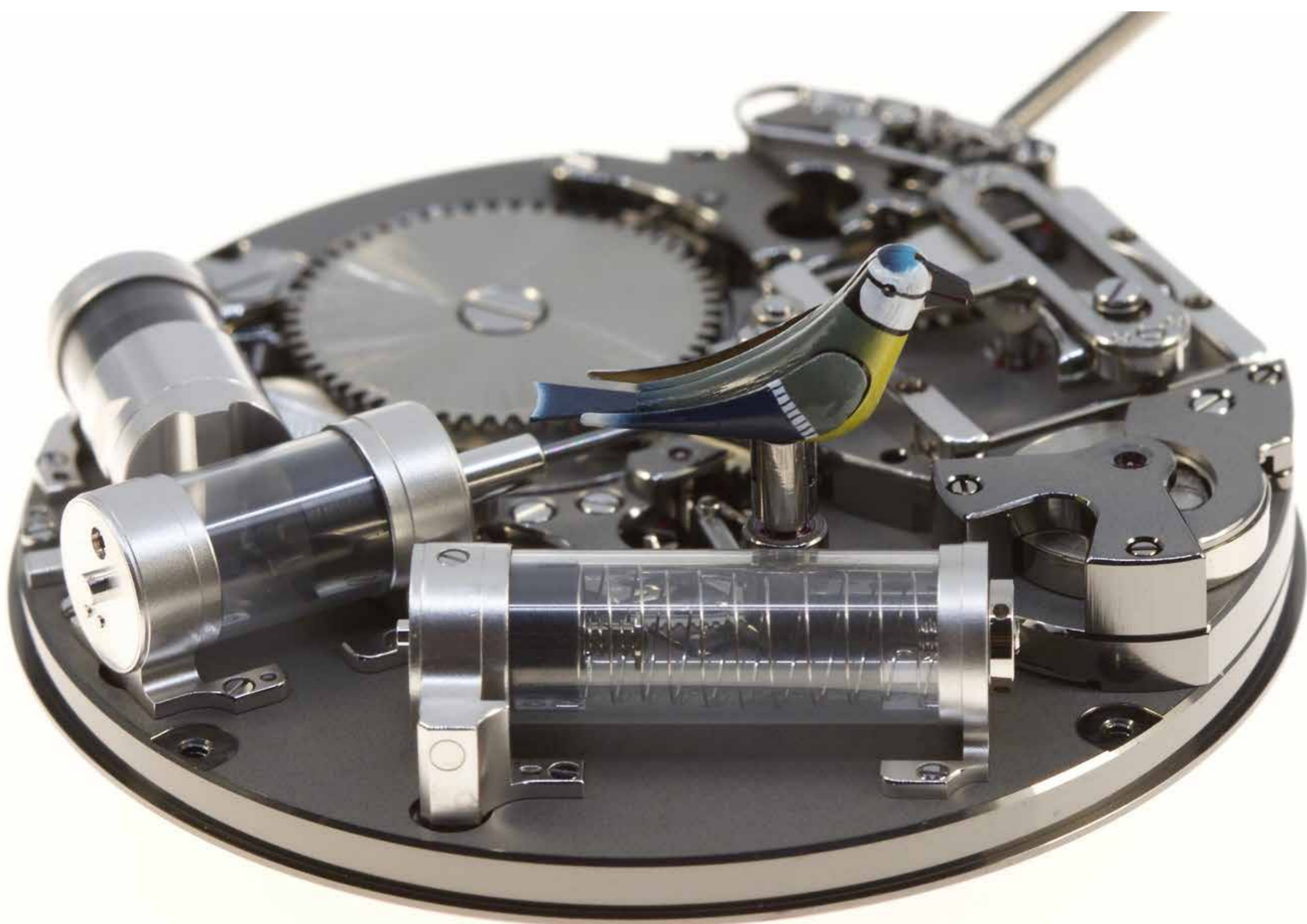
Numerus Clausus (“closed number” in Latin) used here to define the limited edition of the model.

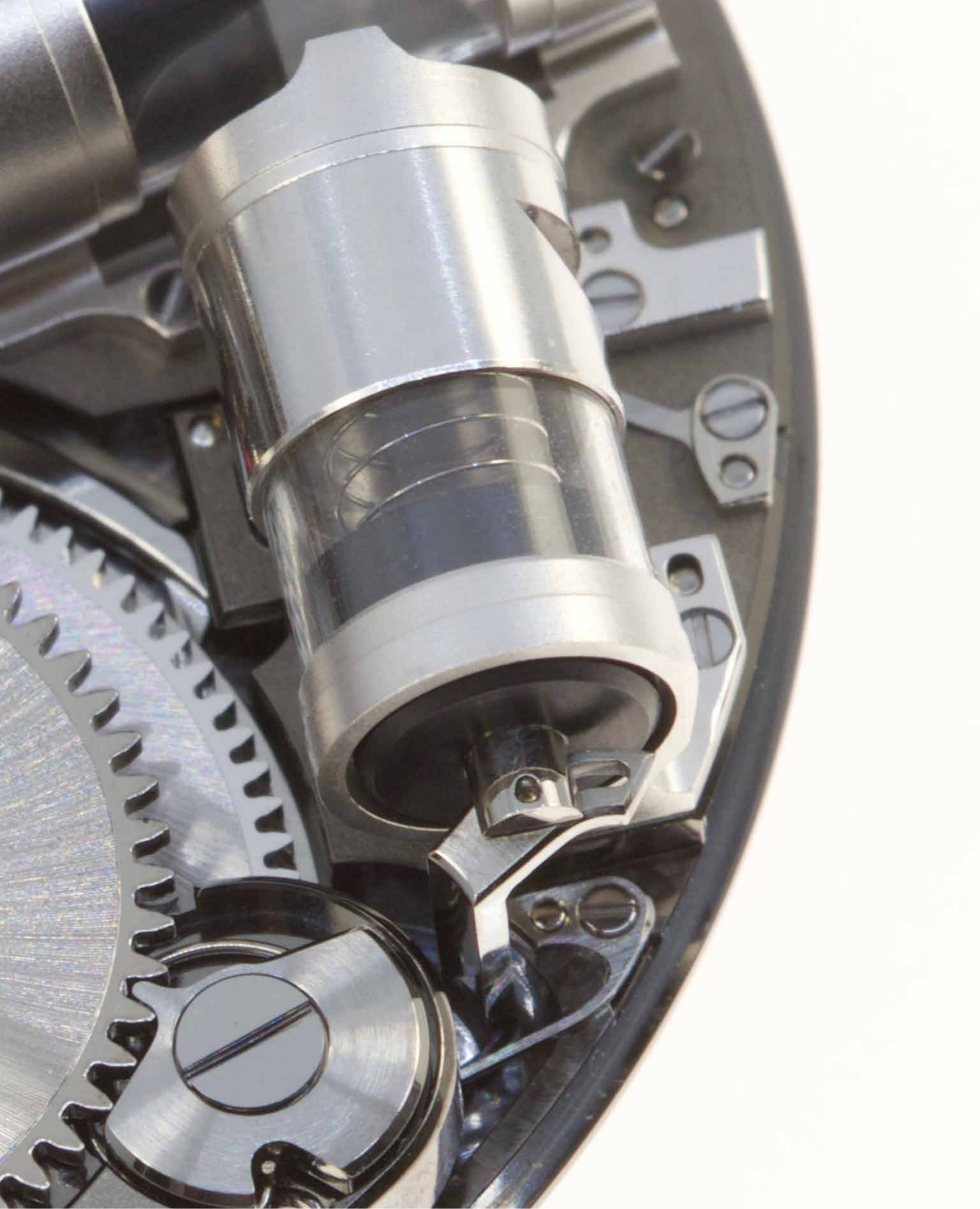


The pistons pump the air, store it and produce the sound. The exact sound it makes is dependent on the speed of the piston and the size of the bellows opening inside the cylinder.

The large upper piston stores the compressed air, the central piston is essentially the air pump generating the air, which is then passed from the upper storage piston to the lower piston which creates the birds whistle.

Each movement requires up to 6 weeks to be assembled by a watchmaker. There are only 4 watchmakers who presently have the knowledge and experience to assemble the entire product. The training process for a full qualified watchmaker to be able to assemble and adjust the product requires a minimum of 4 months. There are in excess of 262 components in the watch.

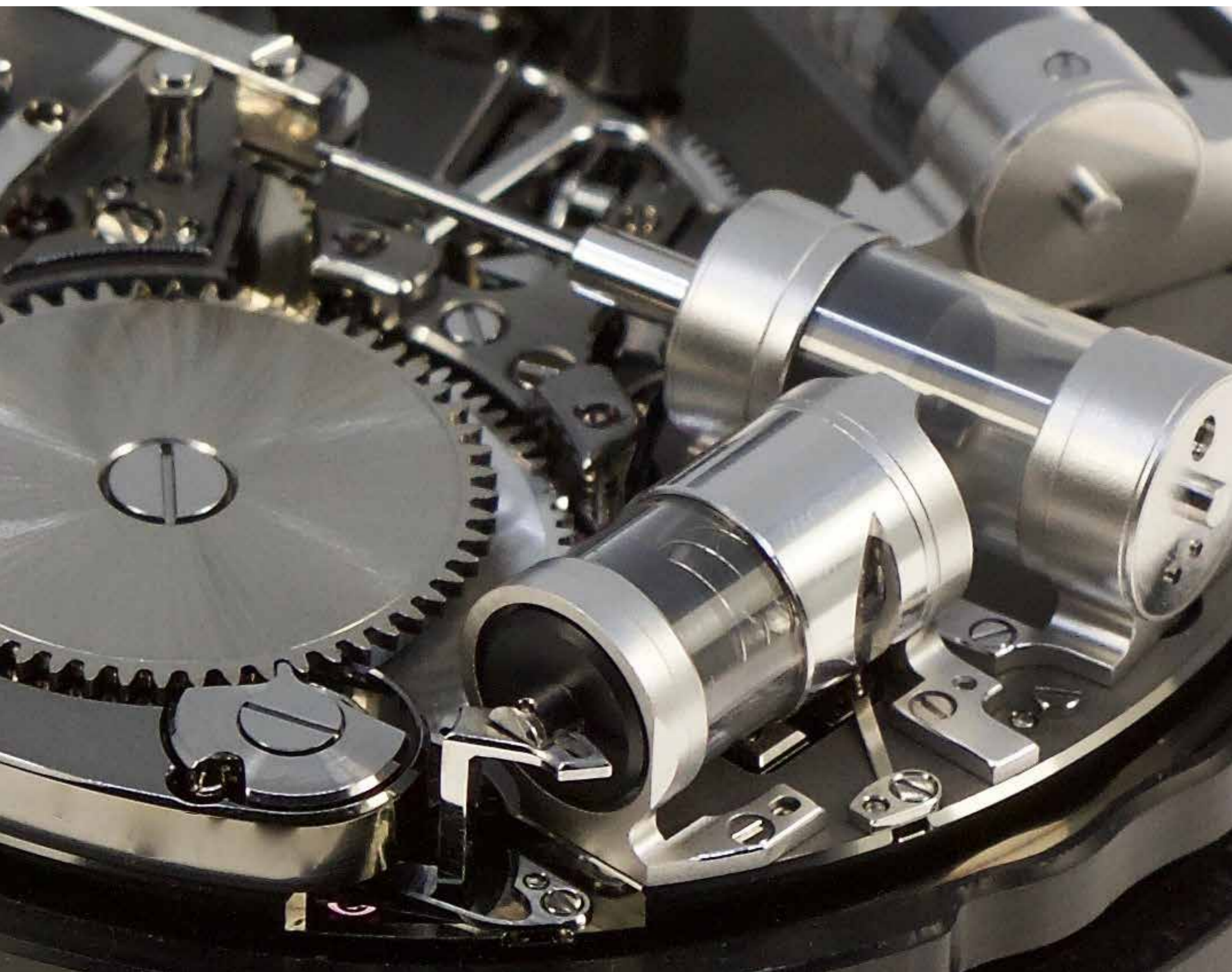


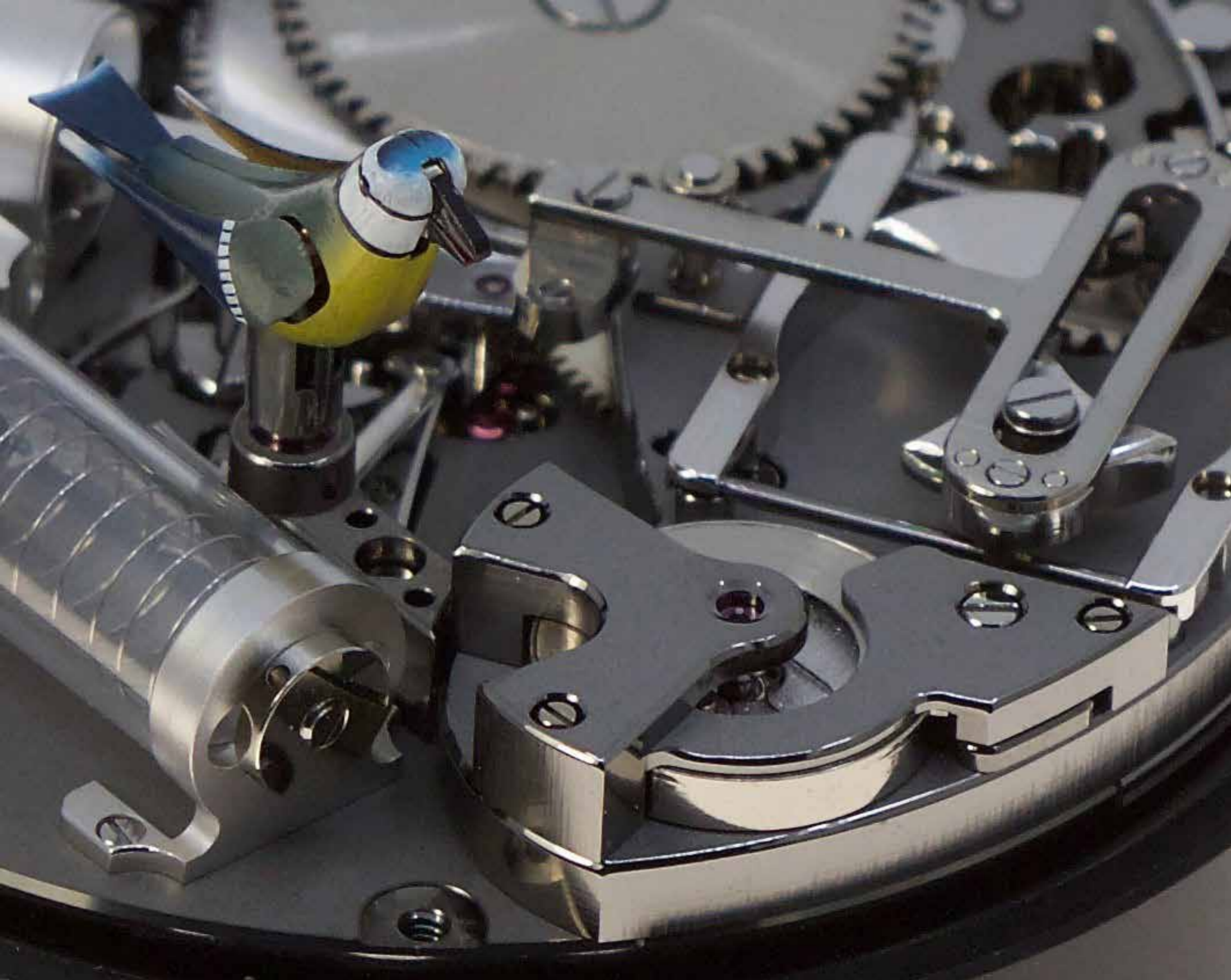


The piston assembly which receives the air from the upper piston/cylinder and generates the actual bird song.

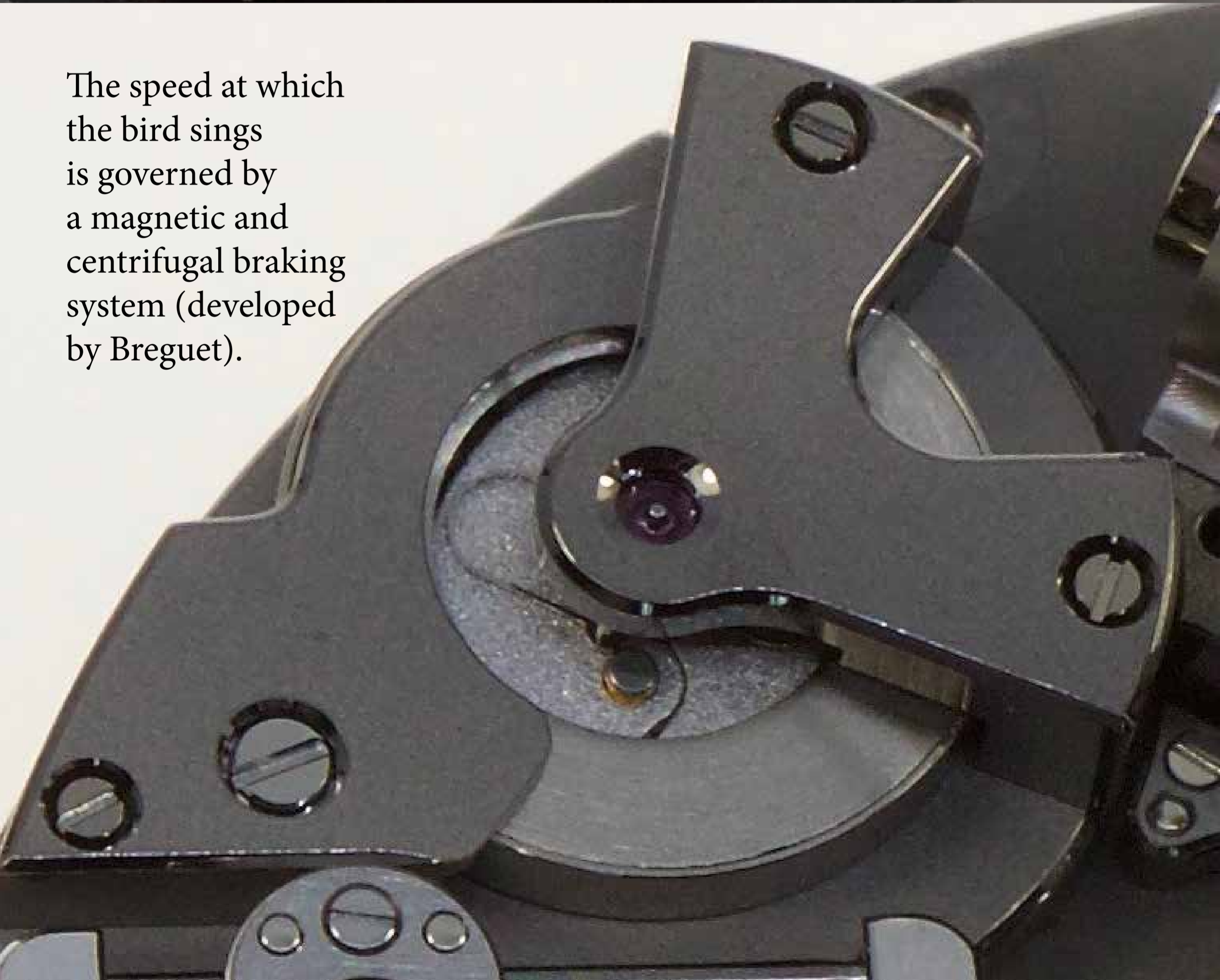


The above image shows the graphite plug inside the tube and the curved lever which adjusts the position of the plug inside the cylinder altering the tone of the bird song produced.





The speed at which the bird sings is governed by a magnetic and centrifugal braking system (developed by Breguet).





The two sets of circular magnets which are adjusted by a screw/plug (the teeth can be seen on the flat disc to the left) to adjust the tension applied to the centrifugal brake which sits between them.



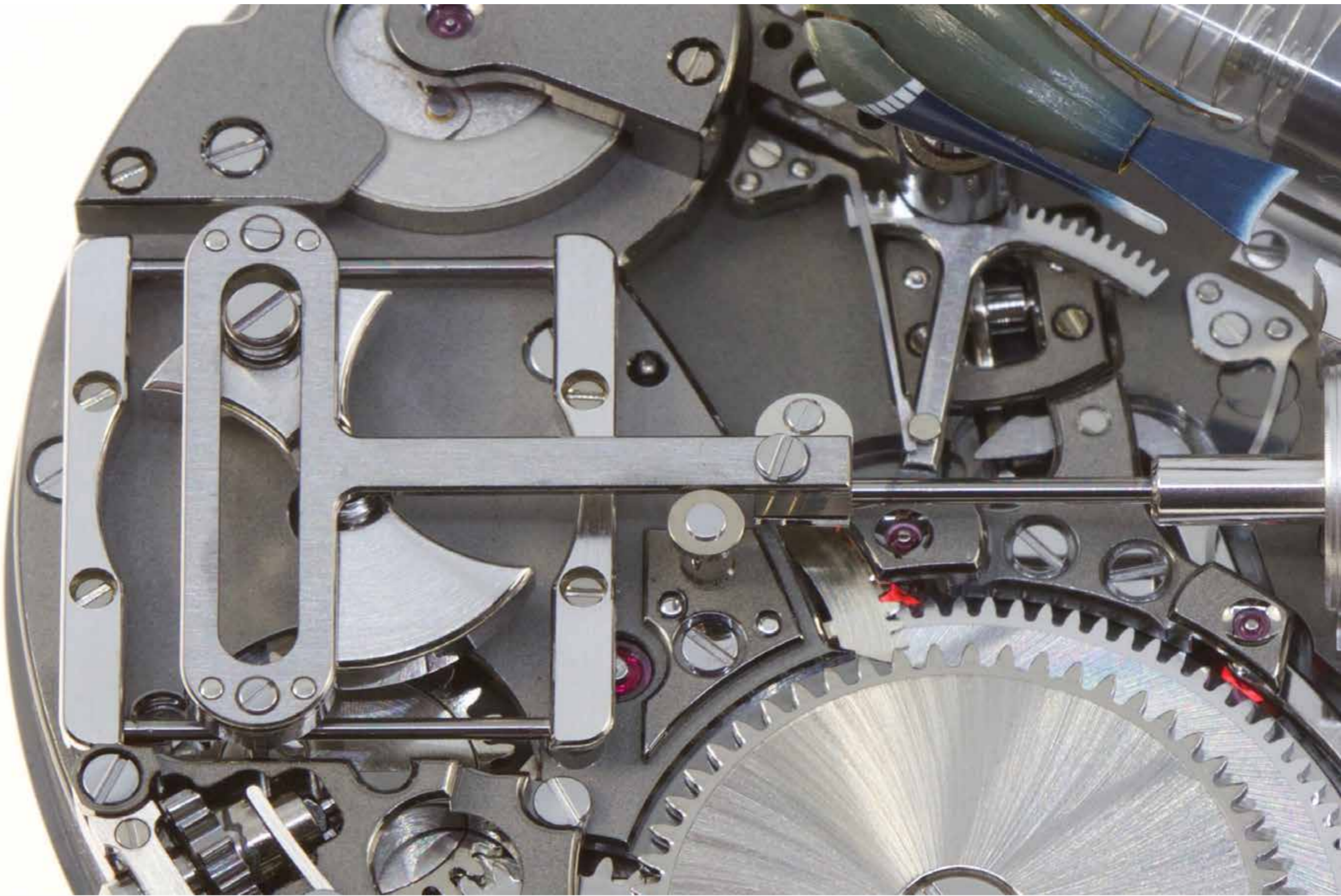
The centrifugal brake.



Below, the dismantled cam shaft, above different views of the drive weight.



Close up of the drive shaft system.

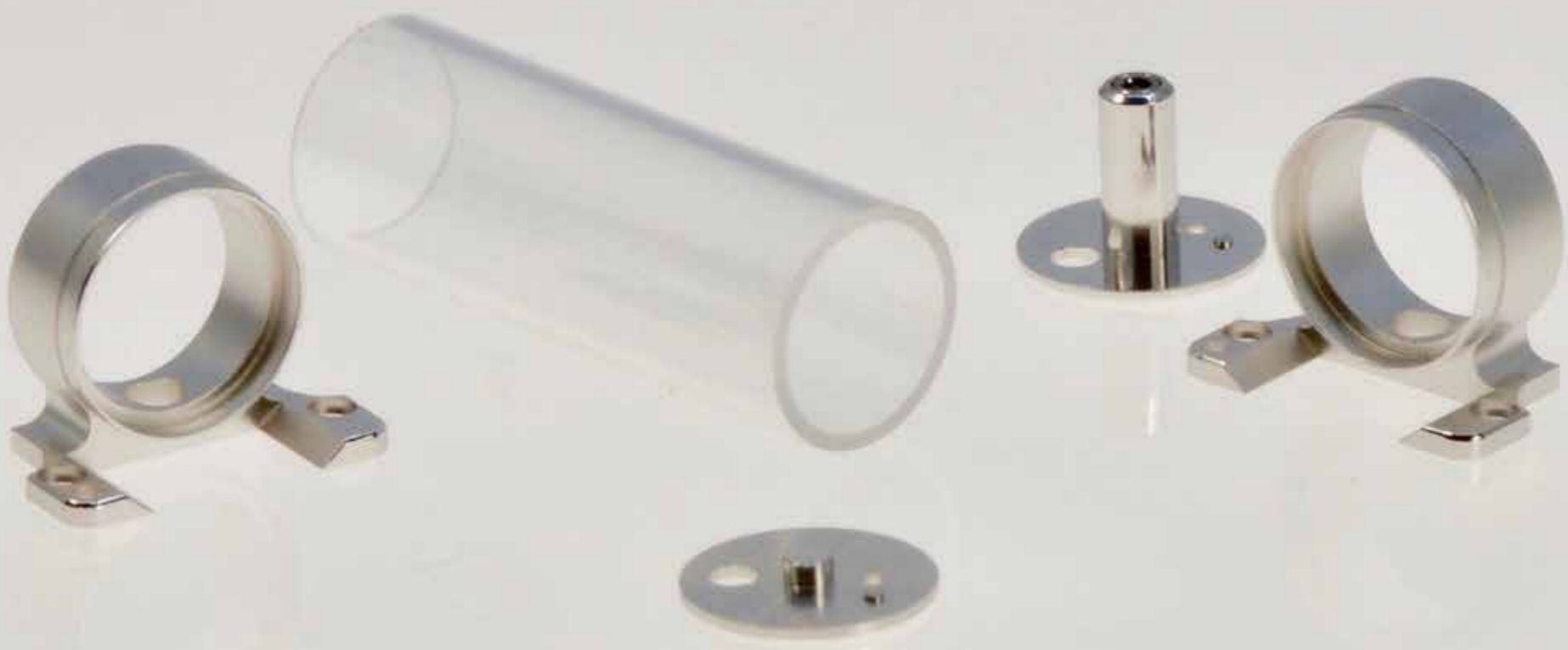


The ratchet wheel, and part of the winding mechanism removed.



The black ring surrounding the movement is to support the mechanism whilst being assembled prior to being cased up.





When assembling the pistons the most time consuming element is the adjustment of the valve (hidden on the inside of the cylinder, allowing air into the chamber but not out. The arms of this piece shown below (between the two discs), are reduced by hand by the watchmaker to under 2/100's mm. They must be of an exact tension to work effectively and the end section must sit perfectly flat against the disc to prevent air from escaping.

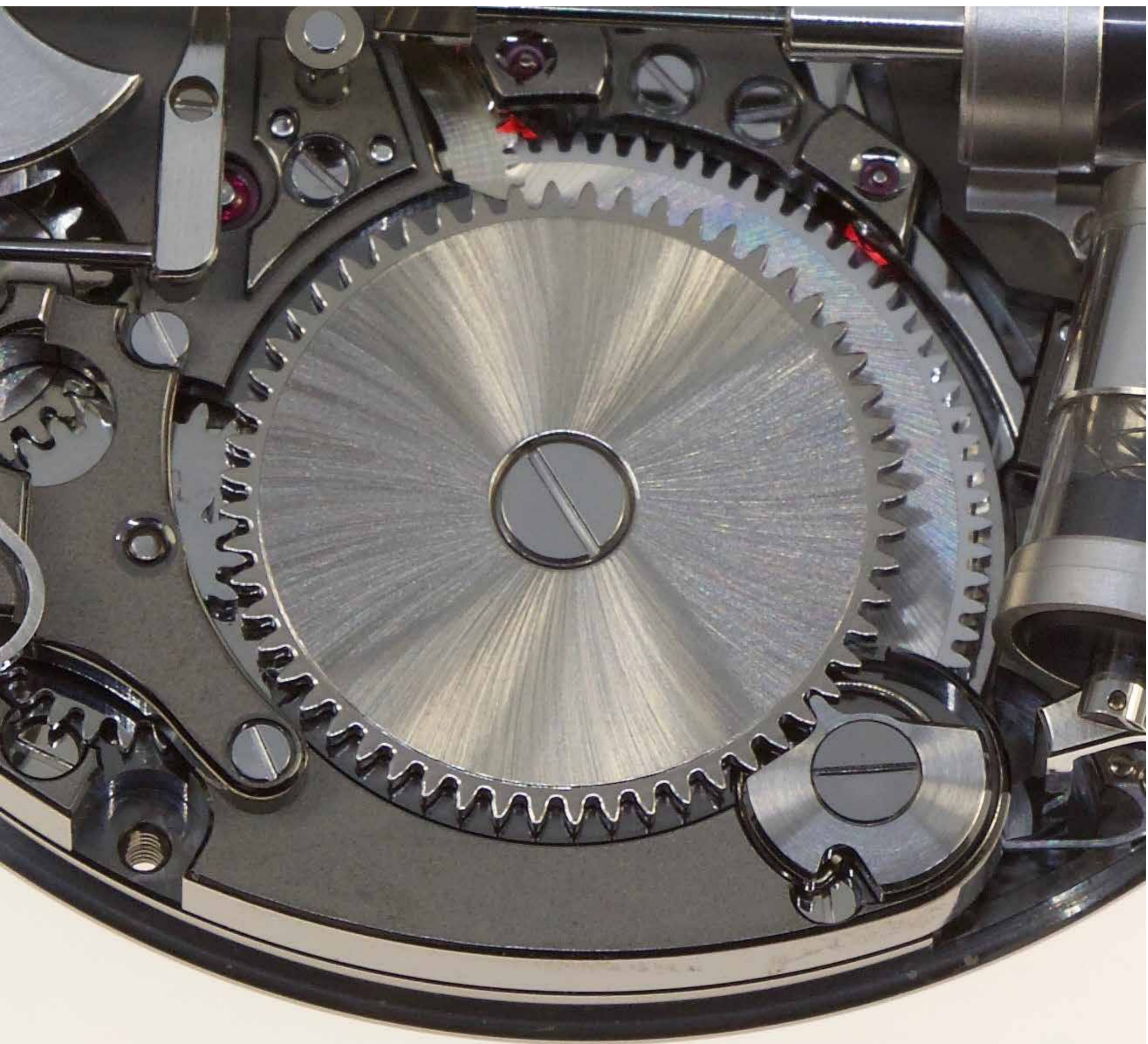


The piston rods are made from tungsten carbide to avoid any form of deformation which might occur due to changes in temperature. The cylinders are made from sapphire.

Graphite is a crystalline allotrope of carbon, and a form of coal. Graphite is the most stable form of carbon. It is light, low in density and has a non-aggressive impact when moving inside of the sapphire cylinders.



The mainspring housed inside of the large barrel is the same design type as that of an automatic movement, with a sliding bridge. Once fully wound the bridge slips around the inside of the barrel avoiding any likely hood of the mechanisms being damaged. The resulting torque from the mainspring is equivalent to 5kg.





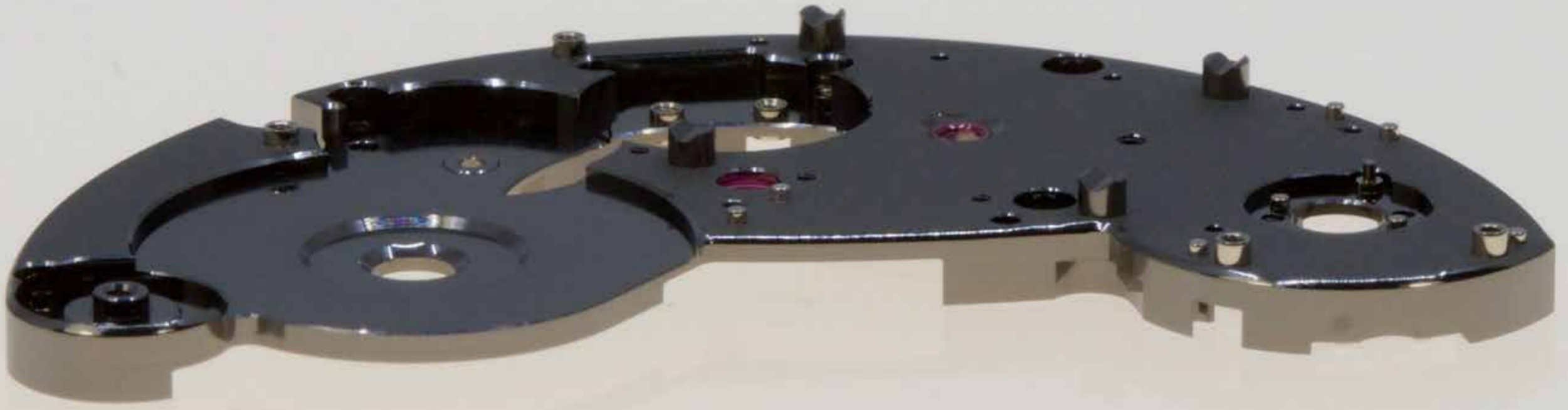
The automaton's mechanism is based on a system requiring three cams, found around the circumference of the barrel; one to direct the bird's rotation, a second to control the opening and closing of the beak, the flapping of the wings, and the movement of the tail; and a third that adjusts the tone of the whistle.





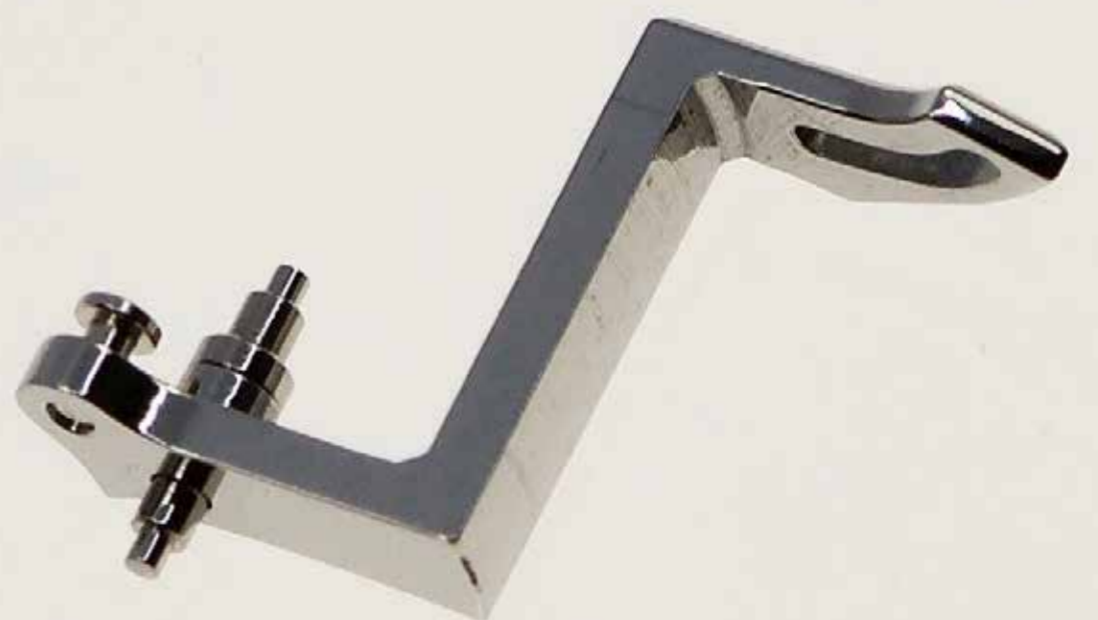
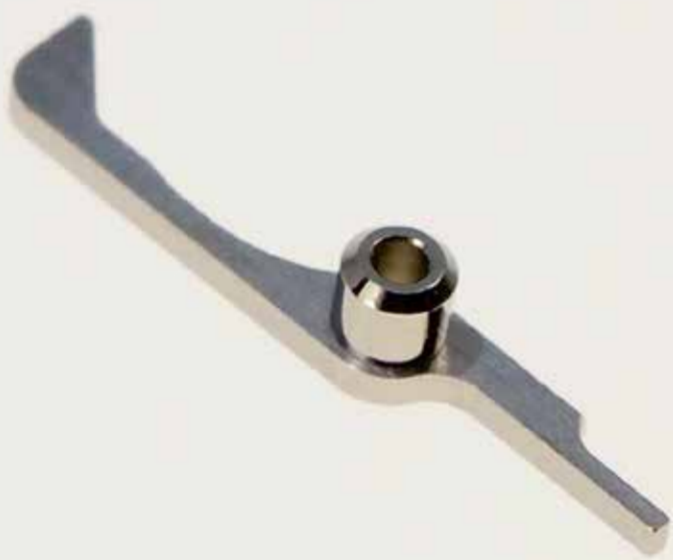
The automaton train wheels which transmit the power between the barrel and the cam shaft.



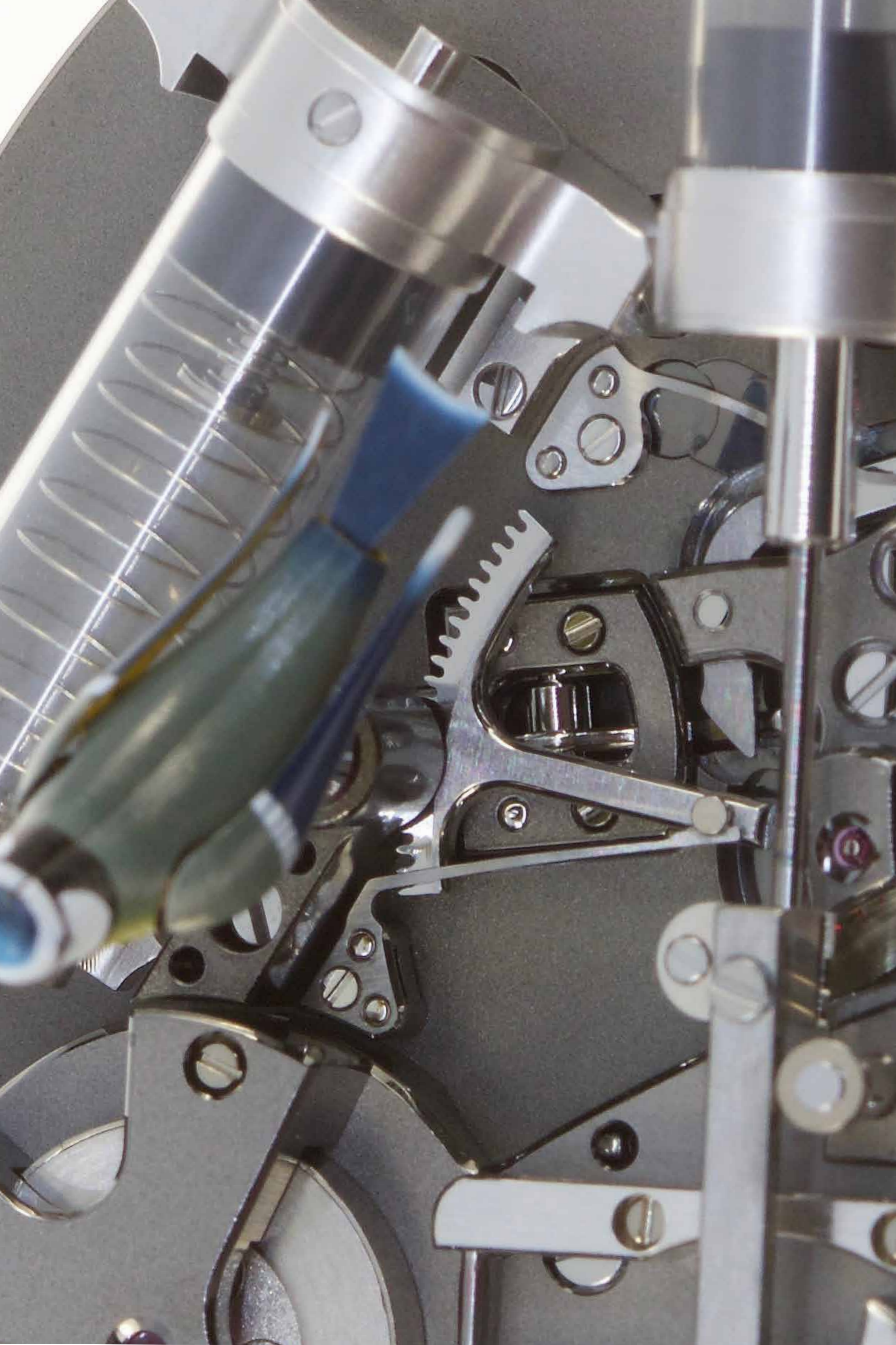


The steel plugs with the 'V' slots hold in place the bars upon which the assembled cam-shaft slides.



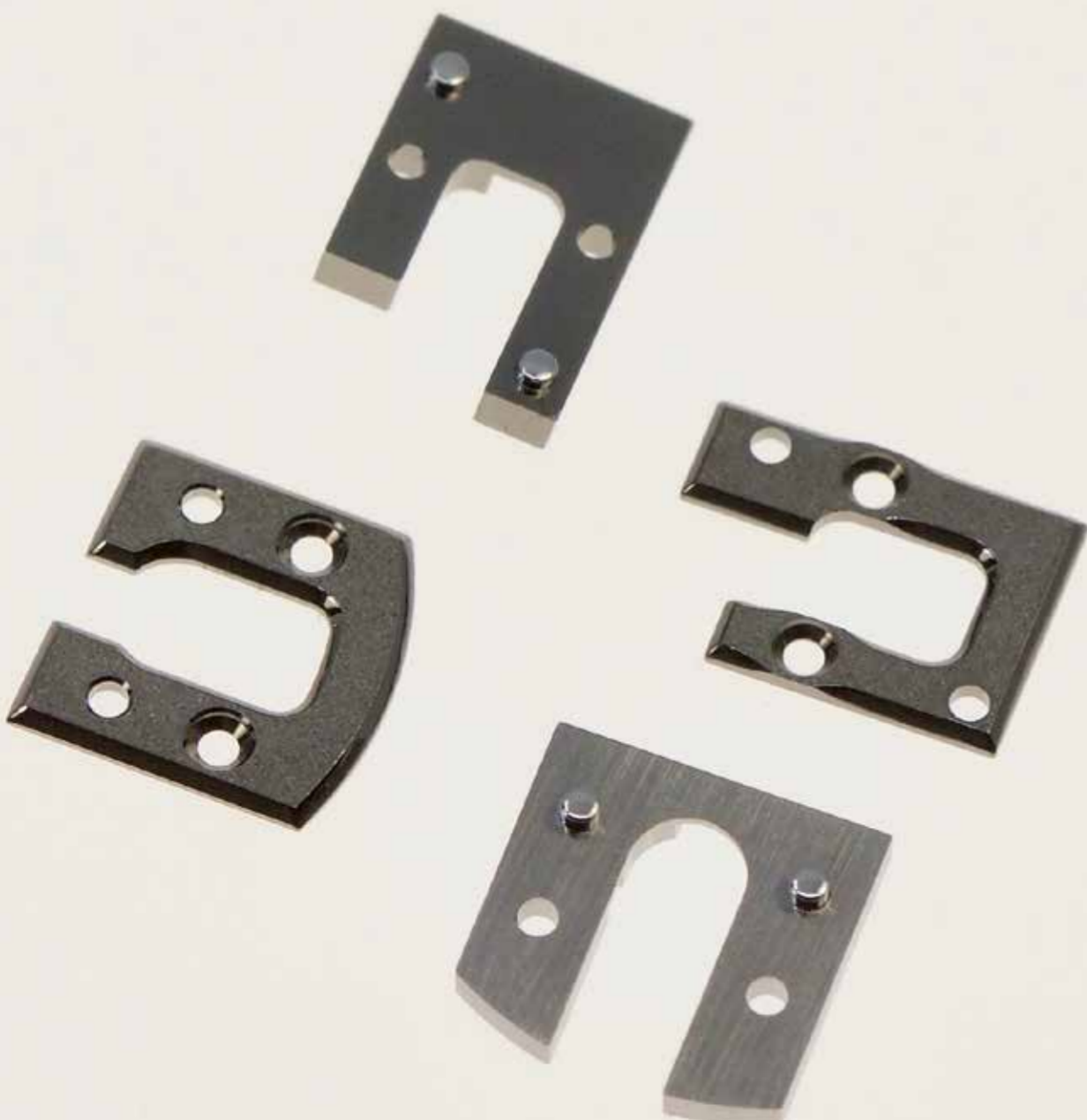


A selection of levers, racks and springs, all made in hardened steel, decorated and assembled by hand.



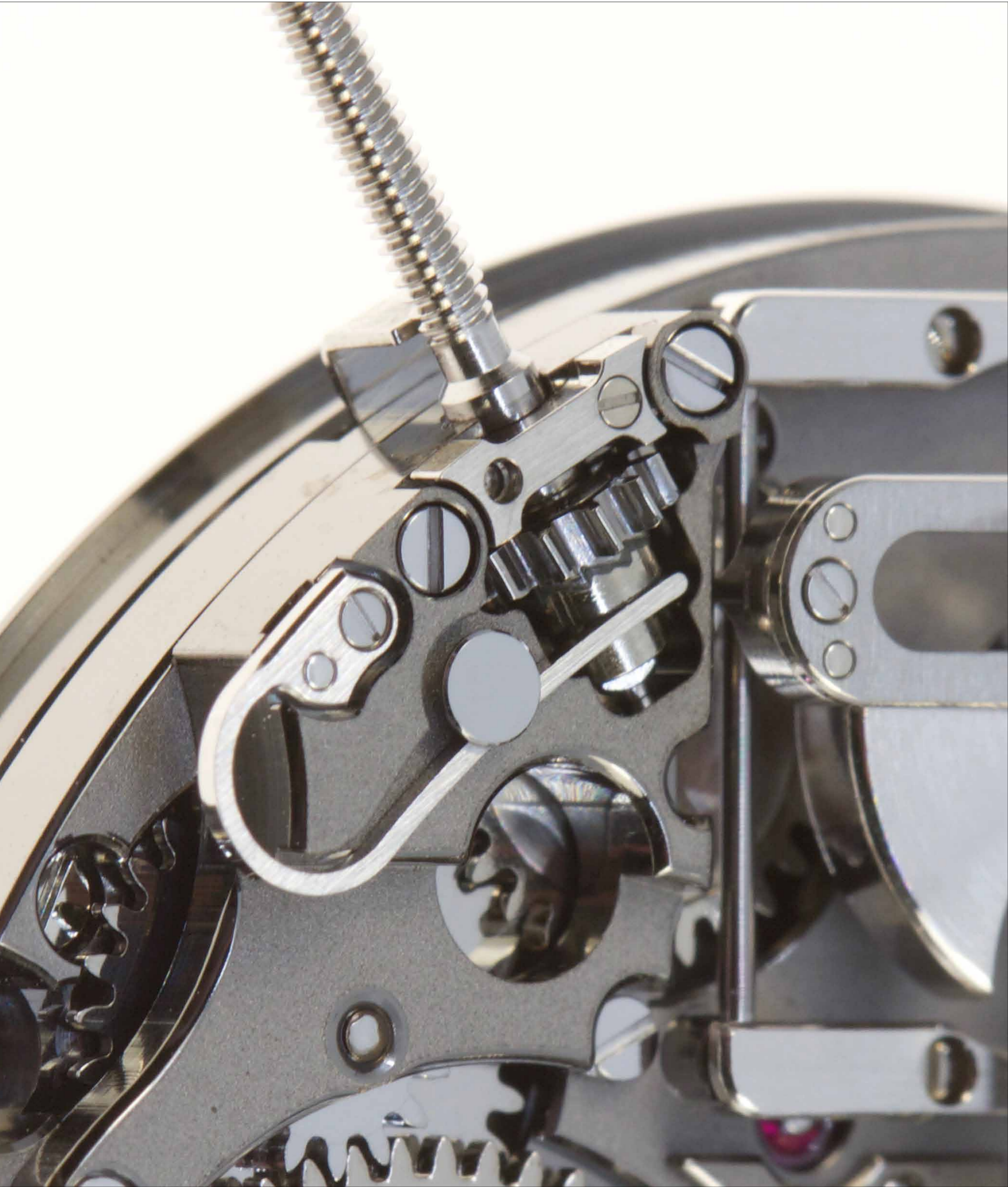
The central rack drives the rotational movement of the bird, leaning directly against one of the cams turning on the barrel.

The pillar wheel, (unseen after assembly) which acts as the selection device for the on/off of the animation and song.



A selection of bridges.

The winding mechanism for
the automaton.





The movement is held in a titanium movement ring which has a black PVD coating. The titanium material reduces the sound absorbed by the case when the bird sings.



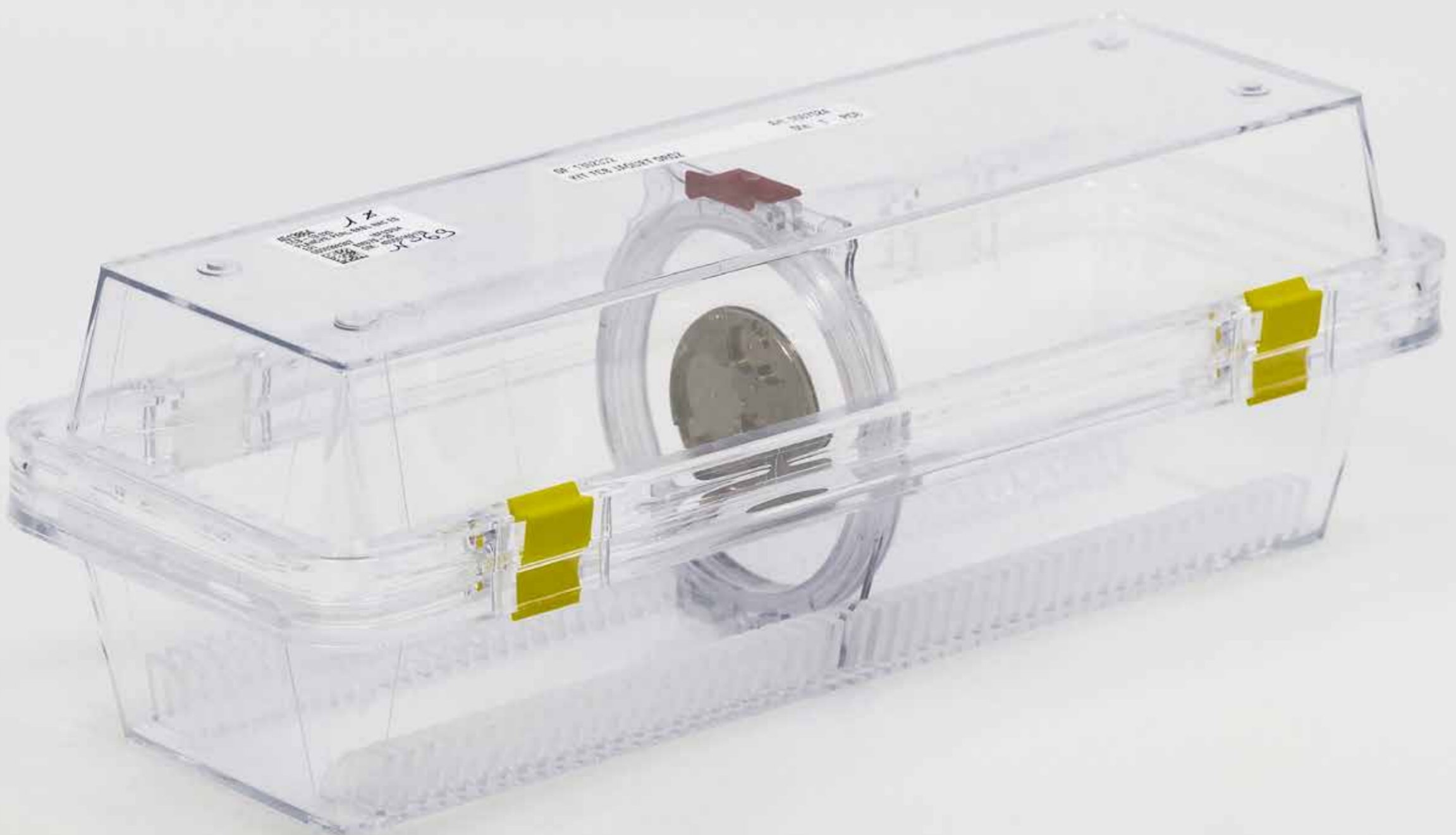


Jaquet Droz 6150, self-winding mechanical movement, silicon balance spring and pallet horns. 21,600 v.p.h. Power reserve 38 hours. 29 Jewels.





An example of how the individual components (here a mainplate) are stored and transported after they are finished and before assembly.



A non-exhaustive collection of the specialised watchmakers tools required to assemble and adjust the mechanism.



Summary

The miniaturisation of complications from horology and the world of automatons is the most challenging transition a mechanism can make. Whether a grand-sonnerie, toubillon or jacquemart, all of these mechanisms, born in the past carry the romance of tradition and history. Translating these mechanisms into wrist carried machines which endure the daily shocks of life is no small achievement. The final product requires consideration that goes beyond that of its ancestor's expectations. As such the results push forward both the innovative execution of the ideas, as well as watchmaking as a cultural statement that defines mechanical art.



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